

<p align="center">LLNL Environmental Restoration Division Standard Operating Procedure</p>	<p align="center">TITLE: Presample Purging and Sampling of Low Yielding Monitor Wells</p>
<p>APPROVAL _____ Date _____</p> <p>Environmental Chemistry and Biology Group Leader</p>	<p align="center">PREPARERS: R. Goodrich and G. Howard</p> <p align="center">REVIEWERS: R. Brown*, T. Carlsen, E. Christofferson*, V. Dibley, J. Duarte, B. Failor*, J. Greci, B. Hoppes*, and B. Ward*</p>
<p>APPROVAL _____ Date _____</p> <p>Division Leader</p> <p>CONCURRENCE _____ Date _____</p> <p>QA Implementation Coordinator</p>	<p align="center">PROCEDURE NUMBER: ERD SOP-2.7</p> <p align="center">REVISION: 2</p> <p align="center">EFFECTIVE DATE: December 1, 1995</p> <p align="center">Page 1 of 6</p>

*Operations and Regulatory Affairs Division

1.0 PURPOSE

To provide well purging (evacuation) and sampling techniques that will obtain representative samples from wells that yield less than three well-casing volumes of water.

2.0 APPLICABILITY

This procedure is applicable to sampling ground water monitor wells that are completed in low-yielding aquifers, which produce less than three well casing volumes prior to sampling.

3.0 REFERENCES

- 3.1 Barcelona, M. J., J. P. Gibb, J. A. Helfrich, and E. E. Garske (1985), *Practical Guide to Ground Water Sampling*, U.S. EPA, Washington, D.C. (EPA-600/2-85/104).
- 3.2 U.S. EPA (1986), *RCRA Ground Water Monitoring Technical Enforcement Guidance Document*, Washington, D.C. (OSWER-9950.1).

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- 3.3 P. M. Kearl, N. E. Korte, M. Stites and J. Baker (Fall 1994), GWMR, *Field Comparisons of Micropurging vs. Traditional Ground Water Sampling*
- 3.4 G. W. Howard, G. Kumamoto (1994), *Cost Effectiveness and Waste Minimization through Low Volume, Pre-Sample Purging Using Historic Sustainable Yield, While Utilizing Existing Sampling Equipment.*, TIE Conference.
- 3.5 U.S. EPA (1992), *RCRA Ground-Water Monitoring: Draft Technical Guidance*, Washington, D.C. (EPA/530-R-93-001).

4.0 DEFINITIONS

4.1 Low-Yielding Monitoring Well

A ground water monitoring well completed in an aquifer having low hydraulic conductivity, and thus a limited capacity to transmit water. If the well is purged at a constant flow rate, either the screened interval or the pump intake will be exposed to the air prior to the removal of three well-casing volumes.

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Personnel

The field personnel's responsibility is to ensure safe completion of evacuating and sampling ground water monitor wells according to guidelines set forth by this procedure, as well as other associated SOPs. The wells to be purged frequently are declared in the quarterly Routine Sampling Schedule provided by the SC.

5.3 Field Support Personnel

The field support personnel's responsibility is to provide the appropriate equipment, collection devices for purge water, and general field support, which enables personnel to perform field activities efficiently and on time.

5.4 Sampling Coordinator (SC)

The SC's responsibilities are to supply a quarterly Routine Ground Water Sampling Schedule, and the SC may also provide an overall quarterly sampling plan, as well as a specific sample plan for each day (Daily Operations Guide or D.O.G.). Technical information required for purging wells is also provided by the SC in the Well Specification Table.

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6.0 PROCEDURES

To remove stagnant water from the well casing prior to sampling, standard well sampling protocol is to purge three times the volume of water standing in the well casing (well-casing volumes) from the well prior to sampling. Preferably, this should be done without lowering the water level in the well below the screened interval, to prevent water from cascading down the screen, possibly volatilizing constituents of interest. However, the sustainable flow rate of some wells at Site 300 and the Livermore Site is so low (<0.5 gpm) that it is impossible to avoid drawing the water level into the screened interval. This SOP describes procedures to minimize problems inherent in sampling low yielding wells, and it provides consistency in sampling such wells.

6.1 Office Preparation

- 6.1.1 Prior to beginning field activities, all applicable SOPs, OSPs, and Site Safety Plans should be reviewed by field personnel. Current copies of all relevant documents shall be retained in the sampling vehicle at all times.
- 6.1.2 Review all pertinent sampling information, such as the quarterly Routine Sampling Schedule and Well Specification Table provided by the SC.

The Routine Sampling Schedule contains the following information:

- Well to be sampled.
- Requested analysis.
- Contract analytical laboratory to which samples are to be sent to for analyses.
- Estimated amount of purge water to be collected, and where and how it will be treated.

Well Specification Table contains the following information:

- Type and size of pump.
- Casing depth and diameter.
- Screened interval.
- Discharge rate.

- 6.1.3 Once the SC has provided the field personnel with the quarterly Routine Ground Water Sampling Schedule and Well Specification Table, obtain appropriate data collection forms (i.e., Chain-of-Custody forms, Ground Water Sampling Logs from SOP 2.1, "Presample Purging of Wells," Attachment A), and assigned field logbook.

6.1.4 Purge Water Collection

A. Site 300

After consulting with the SC, the field support personnel must ensure that wells have sufficient collection drums available at the well head for purge water containment (SOP 4.7B, "Site 300 Treatment and Disposal of Well Development and Well Purge Fluids"). The quantity of purge water to be collected for each well is listed in the Routine Sampling Schedule.

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B. Livermore Site

The SC will provide a specific order of wells to be sampled, in order to efficiently coordinate placement of presample purge water collection tankers. Tankers and drums containing purge water may not be left at the well location and will be logged and disposed of according to SOP 4.7A, "Livermore Site Treatment and Disposal of Well Development and Well Purge Fluids."

- 6.1.5 The number and type of sample containers needed for the sampling event should be obtained from the SC's supply (either from Building 833 at Site 300 or directly from the SC). The SC should keep a sufficient stock of sample containers on hand and should be alerted by field personnel when the supply should be replenished by the contract analytical laboratory (CAL). The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirement. See SOP 4.3, "Sample Containers and Preservation."
- 6.1.5 Check supplies (i.e., disposable 0.45 μ fiber filters, trip blanks, field blanks, plastic bags, etc.), and inform the SC when the supply level is low to avoid running out during an emergency.
- 6.1.7 Field personnel should notify the SC when collecting interlaboratory collocated samples, so that arrangements can be made with the CAL courier for sample pickup. The Livermore Site Ground Water Monitoring SC will call out any interlaboratory collocated samples daily.
- 6.1.8 Field personnel should notify the SC of samples collected with short holding times (i.e., hexavalent chromium, fecal and total coliform). When samples are collected, the SC should inform the CAL ahead of time to allow for preparation.
- 6.1.9 The Administrative Escort Services must be given a 24-hour notice before work is scheduled in restricted areas. If appropriate, arrange access to sampling areas through Building Supervisors or the Control Point Operator per SOP 4.1 "General Instructions for Field Personnel."

6.2 Field Preparation

- 6.2.1 See SOPs 2.1 through 2.6 for specific field instructions.
- 6.2.2 Record all information on the Ground Water Sampling Log (SOP 2.1, Attachment A) and a brief description of the sampling event in the assigned field logbook (see sample entry pasted to inside of field logbook).

6.3 Operation

6.3.1 Site Specific Purging Techniques:

A. Site 300

- 1. Begin purging the well using the appropriate technique as described in SOP 2.1, "Presample Purging of Wells."
- 2. Initial field measurements should be taken from the first available water as soon as purging begins. Field parameter measurements consist of temperature, pH, and specific conductance as described in SOP 2.2, "Field Measurements on Surface and Ground Waters." Once the initial field parameters have been measured a discharge rate should

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be calculated. The well should be purged at a low discharge rate of 1.0–1.5 gpm when using an electric submersible pump. Regardless of the type of purging device used, the intent is to cause the least disturbance possible to the aquifer during the purging process.

3. Take a second set of field parameter measurements (temperature, pH, and specific conductance) halfway through the removal of the first well volume.
4. After removing 90% of the first well-casing volume, take a third set of field parameters just prior to sample collection. A fourth set (three additional measurements) of field parameter measurements need to be obtained at 2- to 3-min. intervals immediately following the third set of measurements and prior to sample collection for wells sampled under the Resource Conservation and Recovery Act (RCRA) guidelines. These wells will be noted in the sampling plan.
5. Purging a well to dryness should be avoided, if at all possible. Samples should be collected after removing one well-casing volume. If purging a well to dryness cannot be avoided then follow procedures below beginning with item 6.3.2.

B. Livermore Site

1. The preferred method of sampling wells that fit the “dry out” criteria is to purge a minimal amount of water prior to sampling using low-volume purge techniques. However, until this technique is approved and an SOP prepared, the technique described above for Site 300 will be utilized.
2. The SC will instruct the sampler as to the preferred sampling method in the D.O.G. The method chosen for sampling each well will be determined by the SC after an interpretation of technical data and in consultation with FTL or other appropriate personnel.
3. Exposing the screened interval and/or the pump intake is to be avoided. The pump intake placement should be mid-screened interval, unless otherwise requested by the FTL or SC.
4. The pumps discharge rate should be reduced to permit the recording of as many parameter measurements as possible, prior to sampling. The use of a flow cell allows continuous measurements to be made.
5. Alert the SC if the pumps discharge rate is not easily reduced to allow sampling prior to the well drying out, a pump change will be requested.

6.3.2 If a well is purged to dryness, determine the amount of water purged from the well after discharge from the pump has ceased.

6.3.3 Once the well has been purged dry, well recovery should be monitored by measuring the water level and calculating the volume of water remaining in the well casing. In order to sample the well, a sufficient amount of water must be available to purge the pump and discharge lines. This amount will vary depending upon pump type, well depth, and number and types of samples required. When a well goes dry prior to sample collection, field parameters should be measured before collecting the sample.

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- 6.3.4 Sampling procedures in SOPs 2.2 through 2.6 should be followed as closely as possible. Ideally, all samples for the analysis of volatile compounds should be obtained within 2 hours of purging the well dry. It is acceptable to obtain these samples within 2 hours, allowing additional well recovery for any remaining samples for nonvolatile analysis. If sampling is split between recovery periods, field measurements should be obtained after each recovery period.
- 6.3.5 If insufficient water is available to obtain the samples for volatile analysis, the well should be monitored approximately every 2 hours until sufficient water is available for sampling. If sufficient water is still not available for sampling at the end of the work day, samples should be obtained immediately the next morning, providing water is available. If there is still insufficient water available for sampling, the 2-hour monitoring schedule should be resumed until enough water is available for sampling.
- 6.3.6 All purging rates, number of times purged, field measurements, and well recovery monitoring should be recorded on the field log forms.

6.4 Post Operation

- 6.4.1 Complete and deliver documentation as described in all water sampling procedures SOPs 2.1 through 2.6.

7.0 QA RECORDS

- 7.1 LLNL Ground Water Sampling Log
- 7.2 Logbooks

8.0 ATTACHMENTS

Not applicable.